U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515

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November 3, 2011

MEMORANDUM

TO: Members, Committee on Transportation and Infrastructure

FROM: The Honorable John L. Mica, Chairman

SUBJECT: Hearing on NextGen: Leveraging Public, Private and Academic Resources

Monday, November 7, 2011, 10:00 a.m. in the Willie Miller Instructional Center Auditorium, Room 101
Embry-Riddle Aeronautical University
600 S. Clyde Morris Boulevard
Daytona Beach, Florida 32114

PURPOSE

The Committee on Transportation and Infrastructure will meet at the Federal Aviation Administration's Florida NextGen Test Bed in Daytona Beach, Florida, to receive testimony from federal government and industry witnesses regarding the Federal Aviation Administration's (FAA) NextGen Test Beds and the agency's efforts to leverage public, private and academic resources to deliver NextGen benefits.

BACKGROUND

NextGen: A Transformation of the National Airspace System:

The present-day national airspace system (NAS) consists of a network of en route[1] airways, much like an interstate highway grid in the skies. Airways are routes in space between

[1] The Federal Aviation Administration (FAA) uses three types of facilities to control traffic: *Airport towers* control airport surfaces and the airspace immediately surrounding airports; *Terminal Radar Approach Control Facilities (TRACONs)* sequence and separate aircraft in terminal airspace – i.e., as they approach and leave airports, beginning about five nautical miles and ending about 50 nautical miles from the airport and generally up to 10,000 to 14,000

fixed points that include navigational radio beacons and waypoints defined by latitude and longitude coordinates and unique names. Because aircraft operating at high altitudes must follow these airways, they often cannot fly the most direct routing from their departure points to their destinations.

Surveillance and separation of aircraft is largely provided by an extensive network of radar sites and air traffic controllers who are directly responsible for ensuring adequate separation between aircraft receiving radar services. Maintaining this separation is achieved through extensive use of voice communications between controllers and pilots over open two-way radio frequencies, not so different from the technologies used during World War II.

Under the current system, controller workload, radio frequency voice-communication congestion, limitations of air traffic control (ATC) radar accuracy, and the coverage and accuracy of ground-based navigational signals impose practical limitations on the capacity and throughput of aircraft in the system. This is particularly true in busy terminal areas near major airports and around choke-points where many flight paths converge.

Currently, the U.S. air transportation system transports about 730 million passengers a year and, combined with general aviation activity, results in about 70,000 flights over a 24-hour period.[2] The FAA predicts that, by 2025, increases in passengers (up 53 percent to 1.1 billion per year) and general aviation activity will result in air traffic increasing to more than 85,000 flights every 24 hours.[3] It is widely acknowledged that the current U.S. air transportation system will not be able to meet these air traffic demands. In 2003, Congress passed H.R. 2115, Vision 100 – the Century of Aviation Reauthorization Act (Vision 100) (P.L. 108-176), which created the Joint Planning and Development Office (JPDO) within the FAA, and tasked it to plan for and coordinate with Federal and non-federal stakeholders the transformation from the current air traffic control system to the NextGen system to meet anticipated traffic demands of 2025.[4]

The NextGen plan consists of new concepts and capabilities for air traffic management and communications, navigations, and surveillance that involves: transitioning from a ground-based radar system to a more automated, aircraft-centered, satellite-based surveillance system; developing more direct and efficient routes through the airspace; improving aviation weather systems; developing data communications capabilities between aircraft and the ground to reduce controller and pilot workload per aircraft; and creating shared and distributed information technology architectures.

To date, the FAA has focused its effort to implement NextGen on deploying seven core infrastructure programs: Automatic Dependent Surveillance – Broadcast (ADS-B); System Wide Information Management (SWIM); NextGen Networked Enabled Weather (NNEW); Data

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feet above the ground; and *Air route traffic control centers* control aircraft in high-altitude en route airspace – i.e., in transit and during approaches to some airports, generally controlling the airspace around and above terminal areas.

[2] FAA email to Aviation Subcommittee Staff, 9-29-11

[3] Ibid.

[4] Public Law 108-176, Section 709.

Communications; NAS Voice Switch (NVS); En Route Automation Modernization (ERAM); and Collaborative Air Traffic Management Technologies (CATMT).[5]

According to the FAA, there are significant, quantifiable benefits associated with the proper implementation of NextGen. FAA estimates show that by 2018, NextGen air traffic management improvements will reduce total delays, in flight and on the ground, about 35 percent, depending on fuel prices and traffic, compared with what would happen if no NextGen program was pursued.[6] The delay reduction will provide $23 billion in cumulative benefits from 2010 through 2018 to aircraft operators, the traveling public and the FAA.[7] With the airspace management improvements planned from 2010 forward, the FAA estimates that airspace users could save about 1.4 billion gallons of aviation fuel during this period, cutting carbon dioxide emissions by 14 million tons.[8] As new avionics are approved for installation in aircraft, the purchase and installation of the NextGen avionics will also drive job growth in the U.S. aviation sector. With as much as $41 billion in total costs to the U.S. economy annually, NextGen has a significant benefit to the broader economy in reduction of delay.[9]

NextGen TestBeds

The NextGen enterprise is made up of several core transformational programs, as well as a myriad of FAA designated NextGen Solution Sets. With both the transformational programs and the NextGen solution sets, the FAA has and will continue to pursue acquisitions of technologies to deliver NextGen benefits.

The NextGen Test Beds provide a forum for industry to test concepts and specific technologies for NextGen acquisitions in an operational environment to gather data and demonstrate benefits before moving into the formal acquisition process. The Test Beds are strategically located to take advantage of in-house expertise at the three locations, and leverage the public, private, and academic resources to develop systems for acquisitions that will deliver tested and proven NextGen benefits.

The NextGen Test Beds serve also as a means for leveraging industry and government resources. The Government Accountability Office reported on the importance of collaboration with industry and NextGen partner agencies for the efficient delivery of NextGen benefits.[10] The GAO cites FAA's assertions that private sector involvement in the research efforts for NextGen has the potential to save a significant amount of time and funding necessary to deliver NextGen benefits.[11] Given the tight budgetary conditions of the federal government, the tech transfer efforts underway at NextGen Test Beds are designed to leverage private sector, academic, and

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[5] *ATC Modernization and NextGen: Near-Term Achievable Goals,* Before the H. Comm. on Transportation and Infrastructure, 111th Cong. vii-xx (2009).

[6] http://www.faa.gov/nextgen/benefits/

[7] Ibid.

[8] Ibid.

[9] "Your Flight Has Been Delayed Again", A report by the Joint Economic Committee, United States Congress, May 2008.

[10] GAO-11-604, *NextGen Technology Transfer*, June 30, 2011.

[11] GAO-11-604, *NextGen Technology Transfer*, June 30, 2011, p. 27.

NextGen partner agency resources. Test beds also serve as a way to draw industry participation in the fielding of NextGen technologies. According to the GAO, "some NextGen test facilities serve as a forum in which private companies may learn and partner with each other, and eventually, enter inter-technology acquisition agreements with the FAA with reduced risk."[12]

The FAA currently operates three NextGen Test Beds. They are located in Daytona Beach, Florida; Atlantic City, New Jersey; and Dallas, Texas.

Florida NextGen Test Bed

The FAA's Florida NextGen Test Bed is a facility operated under contract with Embry-Riddle Aeronautical University and industry partners.[13] The Test Bed includes a research and demonstration facility at the Daytona Beach International Airport (DAB) in Florida. According to Embry-Riddle, "the Test Bed will be used to integrate and demonstrate new and emerging technologies into existing and planned enhancements for the NAS."[14] The Test Bed operates under FAA governance and draws upon the expertise of the FAA, Embry-Riddle Aeronautical University, and industry partners.[15]

According to the FAA, the initial success of NextGen integrated testing at Daytona Beach International Airport as well as a continuing need for proof of concept demonstrations prompted the FAA to ensure long-term sustainability for the Test Bed, beginning in fiscal year 2009. The Test Bed draws funding from the NextGen Facilities and Equipment account for the construction and maintenance of the facility, but the FAA points out that industry and academic partners make in-kind contributions (including time, equipment and materials, space and services) that make the Test Bed possible. Industry partners bring their technologies to the site for testing and Embry Riddle provides the engineering and programmatic expertise at the Test Bed. The FAA governs the activities of the Test Bed, and is currently developing mechanisms to bring demonstrations from concept to deployment in the NAS. The ribbon cutting on November 7, 2011 will mark the opening of the FAA-controlled Test Bed.[16]

The Test Bed is located at the International Terminal of the Daytona Beach International Airport. Because of the collocation of the Test Bed at Daytona Beach International Airport with Embry-Riddle Aeronautical University, the FAA will benefit from the testing carried out at a mixed use airport (both commercial and general aviation) with a sizable fleet of NextGen equipped Embry-Riddle aircraft. The ADS-B equipped Embry-Riddle fleet presents the ability to demonstrate all aspects of ADS-B in an operational environment. Specific features include:[17]

- State-wide coverage (surface to 60 k);
- Wide Area Multilateration (WAM) capability;

[12] GAO-11-604, *NextGen Technology Transfer*, June 30, 2011, p. 26.
[13] FAA email to Subcommittee Staff, October 28, 2011.
[14] Florida NextGen Test Bed Highlights briefing, Embry Riddle Aeronautical University, October 2011.
[15] Ibid.
[16] FAA email to Subcommittee Staff, October 28, 2011.
[17] Florida NextGen Test Bed Highlights briefing, Embry Riddle Aeronautical University, October 2011.

- Ground-Based Augmentation Systems (GBAS) capability;
- Airport Surface Detection Equipment Model-X (ASDE-X);
- Airport (DAB) surface coverage;
- Remote access to additional ADS-B data (i.e., Gulf of Mexico (GoMex)); and
- Universal Access Transceiver (UAT) equipped aircraft (allows Traffic Information Service-Broadcast (TIS-B) and Flight Information Service-Broadcast (FIS-B) testing).

The Florida NextGen Test Bed consists of three separate areas: the Core area, the Integration Suite and the Demonstration Suite. The Core Area consists of the entryway, central passageway, and utilities and data center room where computer systems needed to drive the capabilities of the Test Bed are housed. The Integration Suite provides office space and collaborative environments where industry engineers and University experts will develop concepts for testing in the operational demonstration environment. The Demonstration Suite will be used to conduct the demonstrations of prototype NextGen technologies that have been developed at the Test Bed.

An important feature of the Florida NextGen Test Bed is the intended fluidity of the operations there. Industry partners will bring systems for testing and demonstration at the Test Bed, and where appropriate, the FAA will move some systems into the NAS. Systems not ready for deployment will be cleared so other systems might be tested. The Test Bed currently has partnerships with Embry-Riddle, the Daytona Beach Intl. Airport, GE, Lockheed Martin, Frequentis, UK NATS, Harris Corporation, The Boeing Company, Barco, Mosaic ATM, Ensco, Sensis, Jeppesen, CSC, the U.S. Department of Transportation's John A. Volpe National Transportation Systems Center, and the MITRE Corporation.[18] However, that list is likely to grow as Test Bed activities continue to develop.

New Jersey NextGen Test Bed

At the FAA's William J. Hughes Technical Center in Atlantic City, New Jersey, the FAA operates the NextGen Integration and Evaluation Capability (NEIC). The NIEC opened on January 28, 2010.[19] The New Jersey Test Bed allows concepts that have been developed, including concepts developed at the Florida NextGen Test Bed, to be tested in an environment of mixed legacy and NextGen technologies. According to the FAA, a particular strength of the NIEC is its high fidelity, real-time simulation capabilities which allow for the maturation of tested concepts and the beginning of the development of requirements definitions. Like the Florida Test Bed, the NIEC Test Bed intends to pursue partnerships with other federal agencies, industry and academia.[20]

Characteristics of the NIEC include:

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[18] ERAU email to Subcommittee Staff, November 1, 2011.

[19] FAA briefing, *NextGen Test Bed Capabilities and Future Plans*, May 26, 2010.

[20] http://www.faa.gov/go/niec

- A collocated NIEC display area to support Human-in-the-Loop simulations;
- A real-time, rapid prototyping and simulation environment that simulates the NAS while integrating NextGen enabling components;
- Technical Center and external laboratory integration capabilities;
- Voice communications capabilities;
- Audio, video, and data recording capabilities; and
- The flexibility to support multiple concurrent studies.

Texas NextGen Test Bed

The FAA's Texas Test Bed is located at the NASA/FAA North Texas Research Station (NTX) at Dallas Fort Worth International Airport. The Texas Test Bed is a collaborative effort between NASA Ames Research Center and several FAA organizations, and supports NextGen research through field evaluations, shadow testing, simulation evaluations and data collection and analysis.

Consistent with NASA's aeronautics mission the NASA NTX has long served as a site for numerous air traffic management automation tool field evaluations including: Traffic Management Advisor (TMA) , Final Approach Spacing Tool (FAST) , Conflict Prediction and Trial Planning (CPTP), Collaborative Arrival Planning (CAP) and Direct-To (D2). In addition to conducting these large-scale field evaluations, the NTX team (NASA civil servants and contractors) has developed expertise in: airspace and surface operations analyses; ATC, air carrier and airport procedures; integrating research prototype systems into operational environments and the collection and analysis of quantitative and qualitative air transportation system data sets.[21]

The NTX is located in a 5,000 sq. ft. purpose-built laboratory collocated with the FAA's Fort Worth Air Route Traffic Control Center (ARTCC). The NTX team develops and manages research infrastructure at a variety of FAA, air carrier and airport operational facilities, embedding assets in a rich and varied air traffic environment. For example, the Dallas Fort Worth International Airport features two air traffic control towers and a central airport traffic control tower that can support Test Bed activities. In addition, the Dallas Terminal Radar Approach Control (TRACON) facility is within five miles of the NTX base. In addition, the airline operation centers of Southwest Airlines, American Airlines, and American Eagle are nearby the NTX facility.[22]

[21] *NTX Research Notebook*, March 2011, page 2.
[22] *NTX Research Notebook*, March 2011, page 2-3.

Witnesses:

The Honorable J. Randolph "Randy" Babbitt
Administrator
Federal Aviation Administration

Dr. John P. Johnson
President
Embry-Riddle Aeronautical University

Dr. Gerald L. Dillingham
Director, Physical Infrastructure Division
Government Accountability Office

The Honorable Marion C. Blakey
President and Chief Executive Officer
Aerospace Industries Association

Mr. Peter Bunce
President and Chief Executive Officer
General Aviation Manufactures Association

Mr. Alan Caslavka
Vice President – Avionics
GE Aviation